NON-PUBLIC?: N
ACCESSION #: 9412230051
LICENSEE EVENT REPORT (LER)

FACILITY NAME: Salem Generating Station - Unit 2 PAGE: 1 OF 6

DOCKET NUMBER: 05000311

TITLE: Engineered Safety Feature Actuation: Blackout Signal
Loading of 2B and 2C 4 Kilovolt (4KV) Vital Buses
EVENT DATE: 11/18/94 LER #: 94-014-00 REPORT DATE: 12/14/94

OTHER FACILITIES INVOLVED: DOCKET NO: 05000

OPERATING MODE: 6 POWER LEVEL: 0

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR SECTION:
50.73(a)(2)(iv)

LICENSEE CONTACT FOR THIS LER:

NAME: Michael J. Pastva, Jr.,
LER Coordinator TELEPHONE: (609) 339-5165

COMPONENT FAILURE DESCRIPTION:
CAUSE: SYSTEM: COMPONENT: MANUFACTURER:
REPORTABLE NPRDS:

SUPPLEMENTAL REPORT EXPECTED: NO

ABSTRACT:

At 0103 hours on 11/18/94, with the reactor core off-loaded and a single off-site power source aligned to Unit 2, No. 4 Station Power Transformer (SPT) tripped resulting in "blackout signal" loading of 2B and 2C 4KV vital buses' Diesel Generators (DGs). Expected loss and transfer of electrical loads occurred. The vital buses were maintained powered from their DGs until 0458 and 0537 hours (respectively) on 11/19/94. The most probable root cause of this event is intermittent component failure of either the SPT 4T60 switcher 28 VDC manual trip coil open relay, 3X, or the switcher 125 VDC supervisory relay, 89OX and both were replaced. A strip chart recorder has been installed to continually monitor 6 points within the trip circuit, and the 28 VDC and 125 VDC buses. To-date, this device has not shown signals capable of tripping the 4T60 switcher. The recorder will be maintained until the subsequent restart and return of

the Unit to service. This is intended to ensure that most likely combinations of plant operating evolutions, ambient conditions, and work activity evolutions are monitored to obtain further information, regarding this event.

END OF ABSTRACT

Table "REQUIRED NUMBER OF DIGITS/CHARACTERS FOR EACH BLOCK" omitted.

Plant and System Identification:

Westinghouse - Pressurized Water Reactor

Energy Industry Identification System (EIIS) codes appear in the text as {xx}

Identification of Occurrence:

Engineered Safety Feature Actuation: Blackout Signal Loading of 2B and 2C 4 Kilovolt (4KV) Vital Buses

Event Date: 11/18/94

Report Date: 12/14/94

This report was initiated by Incident Report No. 94-422

Conditions Prior to Occurrence:

Mode 6 - Refueling/maintenance outage 2R8 in progress, with the reactor core off-loaded.

A single source of off-site power to Unit 2 was aligned from No. 4 Station Power Transformer (SPT) {ED}. No. 2 SPT {ED}, and 2A 4KV vital bus {ED} were cleared and tagged for maintenance. In addition, No. 4 SPT was supplying 14 SPT {ED} to Unit 1.

Description of Occurrence:

At 0103 hours on November 18, 1994, No. 4 SPT tripped resulting in an undervoltage (UV) signal tripping 2B and 2C 4KV vital buses and

engineered safety feature (ESF) automatic starting and "blackout signal" loading of the buses' respective Diesel Generators (DGs) {VJ}. Per design, the inservice Unit 2 spent fuel pit (SFP) pump "DB" automatically turned off, and was returned to service, at 0120 hours (same day). Appropriate Control Room alarms and expected loss and transfer of electrical loads resulted from this event.

At 0412 hours (same day), the NRC was notified of this event, in accordance with 10CFR50.72(b)(2)(ii)

Description of Occurrence: (cont'd)

10CFR50.72(b)(2)(ii). 2C and 2B vital buses were maintained powered from their DGs until 0458 and 0537 hours (respectively) on November 19, 1994, to permit adequate assessment of the event prior to restoring off-site power to the buses.

Analysis of Occurrence:

The 4T60 is the 500 KV input circuit switcher for No. 4 SPT unexpectedly opened deenergizing the transformer and causing 14 and 23 SPTs to deenergize. This switcher, was installed during Unit 1 Refueling Outage 1R11 and had been in service approximately 12 months. Unit 2 controls for 4T60 were installed during the ongoing Unit 2 refueling outage and had been in service since November 5.

The deenergized 23 SPT resulted in an UV signal tripping the two inservice vital buses and ESF automatic starting and "blackout signal" loading of the buses' DGs. In addition, the in-service SFP pump was automatically stopped. However, within approximately 17 minutes it was restarted and returned to service. Spent Fuel Pool (SFP) temperature increased by approximately 1.2 degrees Fahrenheit, at a rate of approximately 4.4 degrees Fahrenheit per hour, during the time the SFP pump was not running. ongoing maintenance activities, requiring that 2A 4KV vital bus be deenergized, had deenergized the power supply to one of the two diesel fuel oil transfer pumps. Following the automatic starting of 2B and 2C DGs, the remaining fuel oil transfer pump operated per design.

On Unit 1, this resulted in automatic transfer of 1C 4KV vital bus to 13 SPT and loss of power to operating 11B and 13B circulating water (CW) pumps, as per design, (12B CW pump was cleared and tagged for maintenance). Unit 1 reactor power, which was at 100% prior to the event, was reduced to 85% in response to the reduced CW flow. Following

restoration of power to the circulators, reactor power was returned to 100%.

Immediate Post-Event Conditions:

- 4T60 Control Room green bezel flashing

- No ground fault alarms

Analysis of occurrence: (cont'd)

- No ground fault relay target trips

- 13KV Breakers C-D and D-E remained closed

- 500 KV Section 1 Breakers remained closed

- CW UV flags (as per design)

Investigation shows 4T60 opened completely, indicating that the switcher OC latching relay {EB} remained energized for a complete opening cycle. The relay can be considered a separation point, thereby dividing the circuit into two sections: ahead of the relay towards the 125 volt direct current (VDC) power supply and behind the relay in the direction of the 4T60 drive motor. The OC relay was found in the latched position. Therefore, it can be assumed the cause of the relay actuation originated from the circuitry supplying the relay. The 4T60 logic was reviewed to determine which components could initiate the sequence leading to the event. Eliminated as suspect to the cause(s) of the 4T60 switcher opening:

Depression of the 4T60 push button, which manually opens the switcher, will cause the push button bezel indicator green light to become solidly lit. However, at the time of the event, the light was flashing. Since the light is not designed to flash when manually operated, the possibility of an inadvertent depression of the push button has been eliminated as a possible cause of the switcher operating.

Broken or otherwise closed contacts on either Ground Fault Protection Regular Relay 86/4GR or Back-up Relay 86/4GB can energize the 4T60 OC opening relay; however, the relays were inspected and no defects were found.

Electrical shorting of various cable runs as a possible contributor to

the event was eliminated by satisfactory meggering and continuity checks.

Inspection of the 4T60 89/bb cam operated contacts, the 4T60 operator hand switch, and the OC latching contacts eliminated

Analysis of occurrence: (cont'd)

the possibility that misalignment, vibration, or moisture intrusion, which could have resulted in OC relay latching and 4T60 opening.

Apparent Cause of occurrence:

The most probable root cause of this event is believed to be the result of intermittent component failure of either the 4T60 switcher 28 VDC manual trip coil open relay, 3X, or the switcher 125 VDC supervisory relay 89/OX, which is in electrical series with the switcher OC open contactor. Testing was unable to duplicate failure of either component.

Testing verified the acceptability of the existing components, wiring, and device configurations. No activities, involving either modification or operational, were identified as contributory to this occurrence. Review of pre-operational and in-service testing in progress at the time did not identify a potential cause(s) of this occurrence.

Prior Similar Occurrence:

Review of documentation did not reveal a prior similar occurrence involving loss of an SPT, due to inadvertent opening of an SPT circuit switcher.

Safety Significance:

This event did not affect the health and safety of the public. It is reportable pursuant to 10CFR50.73(a)(2)(iv), due to the automatic starting of 2B and 2C DGs.

Potential safety significance of this event was minimized on Unit 2 as a result of outage planning, which ensured completion of reactor core off-loading to the SFP, prior to alignment of one source of off-site power to the Unit. Following automatic tripping of the SFP pump, the resulting SFP heatup rate was approximately 4.4 degrees Fahrenheit per hour. This allowed

Safety Significance: (cont'd)

sufficient time to restart the pump to reestablish normal SFP cooling or to align alternate means of SFP cooling, in accordance with procedure. In addition, this event resulted in reduction in defense-in-depth of off-site power sources to Unit 1, which placed the Unit in a 72-hour action requirement.

Corrective Action:

Relays 89OX and 3X were both replaced, based upon the conclusions of the investigation to-date.

A strip chart-type recording device has been installed to continually monitor 6 points within the involved trip circuit, as well as both the 28 VDC and 125 VDC buses. To-date, this device has not shown any signals capable of tripping the 4T60 switcher. This device will be maintained in place until the subsequent restart and return of the Unit to service following completion of the ongoing refueling outage. This is intended to ensure that the most likely combinations of plant operating evolutions, ambient conditions, and work activity evolutions are monitored to obtain further information, regarding this event.

J. J. Hagan
General Manager
Salem Operations

MJPJ:vs

REF: SORC Mtg. 94-094

ATTACHMENT TO 9412230051 PAGE 2 OF 2

PSE&G

Public Service Electric and Gas Company P.O. Box 236 Hancocks Bridge, New Jersey 08038

Salem Generating Station
December 14, 1994

U. S. Nuclear Regulatory Commission
Document Control Desk
Washington, DC 20555

Attn.: Document Control Desk

SALEM GENERATING STATION
LICENSE NO: DPR-75
DOCKET NO: 50-311
UNIT NO: 2

LICENSEE EVENT REPORT NO. 94-014-00

This Licensee Event Report is being submitted pursuant to the requirements of Code of Federal Regulation 10CFR50.73(a)(2)(i)(B). Issuance of this report is required within thirty (30) days of event discovery.

Sincerely,

J. J. Hagan
General Manager
Salem Operations

MJPJ: vs

SORC 94-094

C Distribution
LER File

The power is in your hands

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